



# Investigating the effects of behavioral change, social support, and self-efficacy in physical activity in a collectivistic culture: Application of Stages of Motivational Readiness for Change in Korean young adults

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## ABSTRACT

The study investigated the roles of social support, self-efficacy, and behavioral change in physical activity (PA) in the Korean culture. The subjects were 164 Korean college students. In November 2016, the study participants completed an online survey asking about PA behavior, PA Self-Efficacy, PA Stages of Change (stages of behavioral change in PA), and Social Support for PA. The collected data were statistically analyzed through structural equation modeling. In the results, PA Stages of Change had a direct effect ( $\beta = 0.57, p < .01$ ) on PA with an explanatory power of  $r^2 = 0.46$ . Moreover, PA Self-Efficacy had an indirect ( $\beta_{\text{indirect}} = 0.29$ ) effect on PA through PA Stages of Change as PA Self-Efficacy had a direct effect ( $\beta = 0.50, p < .001$ ) on PA Stages of Change. However, Social Support for PA did not show an effect on other factors. Additionally, Social Support for PA had a correlation of  $r = 0.45 (p < .001)$  with PA Self-Efficacy. The study concluded PA Stages of Change is a significant PA predictor. Moreover, high PA Self-Efficacy indirectly helps Korean young adults to be more physically active by fostering advancement on the stages of behavioral change in PA. In contrast, Social Support for PA does not have a significant association with PA or PA Stages of Change. This non-significance of Social Support for PA can be explained with Korea's collectivistic culture. Furthermore, there is a possibility that Social Support for PA can positively affect PA by interacting with PA Self-Efficacy.

## 1. Introduction

Many researchers and practitioners consider physical activity (PA) a factor yielding diverse physical and mental health benefits (Ball, 1996; Bouchard et al., 1994; U.S. Department of Health and Human Services, 1996; Wankel & Berger, 1991). The Centers for Disease Control and Prevention (CDC) (2014) also reported that physically inactive adults tend to die earlier and suffer from heart disease, type 2 diabetes, some cancers, stroke, and depression. Because of positive effects of PA in health promotion and disease prevention, health professionals have studied how to motivate individuals to be physically active. In public health, there is a well-organized theoretical approach, Stages of Motivational Readiness for Change (SMRC) (Marcus et al., 1992a; Marcus & Forsyth, 2008; Marcus et al., 1992b; Marcus et al., 1992c; Marcus et al., 1992d), which discusses how to motivate people to be physically active.

SMRC explains people's behavioral changes in PA occur through the five stages (PA Stages of Change) of pre-contemplation, contemplation, preparation, action, and maintenance (Marcus et al., 1992a; Marcus & Forsyth, 2008; Marcus & Lewis, 2003; Marcus et al., 1992c). According to SMRC, an individual who is more physically active is more likely to

be found at a later stage. Furthermore, individuals who have higher PA Self-Efficacy tend to belong to later PA Stages of Change (Marcus et al., 1992a; Marcus & Forsyth, 2008; Marcus & Lewis, 2003; Marcus & Owen, 1992; Marcus et al., 1992d). Also, people who receive more Social Support for PA are more likely to increase their PA and belong to later PA Stages of Change (Marcus et al., 1992a; Marcus & Forsyth, 2008; Marcus & Lewis, 2003; Sallis et al., 1987; Tessaro et al., 1998).

However, the previous SMRC studies had a limitation that the research findings overly emphasized PA Stages of Change and did not investigate concurrent associations among PA, PA Stages of Change, Social Support for PA, and PA Self-Efficacy. Moreover, the past studies discussed their findings only within the theory of SMRC belonging to the public health domain, even though social support and self-efficacy are susceptible to social science contexts such as culture, generation, and gender. To fill the gap, the current study examined simultaneous relationships of Social Support for PA, PA Self-Efficacy, PA Stages of Change, and PA. The present study also extended its findings and discussions beyond SMRC by employing social science angles of culture, Albert Bandura's (Bandura, 1986; Bandura, 1995) theoretical ideas about self-efficacy, social support, collectivistic culture, and

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individualistic culture, and other supporting articles which discuss culture, self-efficacy, and social support.

The present study selected Korean college students as the study participants because SMRC was rarely applied to Korean young adults. One study (Kim, 2008) employed SMRC on Korean university students but did not utilize Social Support for PA. Other previous SMRC studies chose Korean children, adolescents, or adults aged between 22 and 56 as the subjects (Kim, 2004; Kim & Cardinal, 2009; Park et al., 2011). Additionally, only < 50% of Korean young adults aged 20 to 29 participated in PA twice or more per week in 2014, 2015, and 2016 according to the Ministry of Culture, Sports, and Tourism (2017). The present study was expected to provide significant implications about how to motivate Korean young adults to be physically active.

Furthermore, the current study utilized an innovative analytic method of structural equation modeling (SEM). The technique enabled the present study to detect new effects and paths in interactions of Social Support for PA, PA Self-Efficacy, PA Stages of Change, and PA. In the data analysis, the present study examined the following five research hypotheses (RH).

1. RH 1: PA Stages of Change has a direct effect on PA
2. RH 2: PA Self-Efficacy has a direct effect on PA
3. RH 3: PA Self-Efficacy has an indirect effect on PA through PA Stages of Change
4. RH 4: Social Support for PA has a direct effect on PA
5. RH 5: Social Support for PA has an indirect effect on PA through PA Stages of Change

## 2. Methods

### 2.1. Study design and sampling

A power analysis determined the minimum sample size of 87 in the current study. For the power analysis, Free Statistics Calculators ver. 4.0 was utilized with the analysis conditions of minimum effect size = 0.10, power level = 0.8, the number of latent variables = 1, the number of measured variables = 6, and probability = 0.05. Moreover, literature discussing sample size for SEM recommended the minimum sample size of 100 (Tinsley & Tinsley, 1987; Anderson & Gerbing, 1988; Ding et al., 1995; Tabachnick et al., 2001). The current research employed a cross-sectional design in which the present study investigated the simultaneous associations of the variables of PA, PA Self-Efficacy, PA Stages of Change, and Social Support for PA. The number of the subjects was 164 (males = 91, females = 73), and the response rate was 68.90%. The sample size was appropriate to detect effects of the structural model formulated in the current study.

The present study recruited study participants at a university located in the Asan City, South Korea. The data collection was conducted in collaboration with the university's College of Health Science and the office of the registrar in November 2016. The faculty and student association members of the college provided the information about the study including the confidentiality of personal information and the voluntary nature of study participation to all students enrolled in all courses offered by the college. The first author of the current study invited only the students who agreed to participate in the research by distributing invitation emails with URLs linking to an online survey formulated by the Qualtrics software.

The confidentiality of personal information and the voluntary nature of study participation were provided to the students both in person and online. Each student who submitted a completed survey received a \$10 online gift card as an incentive. The Institutional Review Board (IRB) of the university to which the authors belonged approved the data collection protocol as exempt.

### 2.2. Measures

#### 2.2.1. Measuring PA Stages of Change

The current study used a subscale of the SMRC scale (Marcus & Forsyth, 2008) in assessing the subjects' PA Stages of Change. The subscale has four items about a person's PA habits and intention to raise PA level. An individual's answers to the four items categorize the study subject into pre-contemplation, contemplation, preparation, action, or maintenance stage. Because the items are categorical, the present study did not yield Cronbach's alpha. However, the present study utilized PA Stages of Change as an interval variable by coding the data into one (pre-contemplation), two (contemplation), three (preparation), four (action), and five (maintenance), and the validity of the variable was tested through confirmatory factor analysis (CFA).

#### 2.2.2. Assessment of PA

The present study measured subjects' PA with a measurement scale used in an SMRC study (Young et al., 2015). This measurement scale has three items asking about an individual's behavioral frequency of participation in vigorous, moderate, and mild intensity PA for the past seven days. The current study utilized these three items as indicators for the latent variable of PA in the SEM analysis process.

#### 2.2.3. Measurement of PA Self-Efficacy

The present study employed a subscale of the SMRC questionnaire in assessing the subjects' PA Self-Efficacy (Marcus et al., 1992d). The subscale is comprised of five items asking a person's confidence to be physically active under certain conditions which disrupt PA participation (e.g., when oneself is tired, when it is raining or snowing). The items have answer choices on a five-point scale: never confident = zero, slightly confident = one, moderately confident = two, very confident = three, and extremely confident = four. A score of a person's PA Self-Efficacy is the mean of all the five items. Solid reliability (Cronbach's alpha = 0.79) of the PA Self-Efficacy scale was found in the current study.

#### 2.2.4. Assessing Social Support for PA

The current study modified and deployed a subscale of the SMRC scale in gauging Social Support for PA (Marcus & Forsyth, 2008). The adjustment was that the Social Support for PA subscale asks about how often an individual received Social Support for PA from family, friends, acquaintances, or coworkers during the past three months, whereas the original version inquires only about family's and friends' and divides the two types of support into different categories.

The measurement scale includes 13 items. The answer choices for each item have a five-point scale: none = zero points, rarely = one point, a few times = two points, often = three points, and very often = four points. The item seven and eight are inversely coded because those items are related to preventing a person from being engaged in PA. The sum of the 13 items is a score of the measurement scale. The Cronbach's coefficient alpha of the research instrument was 0.86 in the present study.

### 2.3. Data analysis strategies

Data cleaning was the first step of the analysis, and three standard deviations were the data cleaning criterion to delete data (Moon, 2013). In the current study, there were two values which slightly crossed the data cleaning standards. As the two outliers did not distort the normal distribution of the dataset, the authors decided to keep the two values for the originality of the data collected. After the first step, the descriptive statistical analysis produced the frequency and the percent of the study participants' demographics. The descriptive statistical analysis also yielded the variables' means, standard deviations, and standard errors. Next, the current study examined the convergent, discriminant, and nomological validity of the research instruments

through CFA (Kaplan, 2008; Lee & Lim, 2013; Moon, 2013).

The present study investigated the research hypotheses in a statistical, structural model. The significance of the direct ( $\beta$ ) and indirect ( $\beta_{\text{indirect}}$ ) effects of the factor loading values verified or rejected the research hypotheses; the significance level was at  $\alpha = 0.5$ . In addition to the significance and magnitude of the factor loading values, the current study examined the effect sizes ( $r^2/R^2$ ).

### 2.4. Software

The present study formulated the online survey by deploying the software of Qualtrics. The data cleaning and the descriptive statistical analysis were conducted with the IBM Statistical Package for the Social Sciences (SPSS) 24. The current study utilized the IBM software of Analysis of Moment Structures (AMOS) 24 in the SEM process including CFA and the hypothesis test.

### 2.5. Translation

For the Korean college students, the present study translated the measurement scales of PA, PA Stages of Change, PA Self-Efficacy, and Social Support for PA into the Korean language. The study information and the data collection protocol were thoroughly reviewed by the first author of the current study and a professor who were bilingual in English and Korean and whose research areas included predictors and outcome of PA behavior. These two scholars initially translated the English versions into Korean.

The questionnaire draft translated into Korean was examined by a professor whose native language was Korean and whose research domains contained PA, social support, and related psychological factors. The individual had research experience with the SMRC questionnaire and had an in-depth understanding of the theoretical context. The scholar thoroughly reviewed the draft of the Korean version and made slight revisions for a better articulation of the meanings. The revisions included contextual wording, sentence structure, and vocabulary enhancement. After all the translation process, the current study deployed the final Korean version.

## 3. Results

### 3.1. Demographic characteristics

The number of the total study participants was 164 (mean age = 21.68). In the subjects, there were 91 males (55.5%) and 73 females (44.5%). The average height was 169.52 cm (males = 175.42 cm; females = 162.17 cm), and the mean weight was 65.84 kg (males = 74.41 kg; females = 55.15 kg). In the total participants, there were 32 freshmen, 51 sophomores, 38 juniors, and 43 seniors. The average BMI of the total subjects was 22.71; 11 students (15.1%) were underweight ( $BMI < 18.5$ ), 54 (74%) students were in the normal weight level ( $18.5 \leq BMI < 24.9$ ), seven students (9.6%) were overweight ( $25 \leq BMI < 29.9$ ), and one student (1.4%) was obese ( $30 \leq BMI$ ).

In total, 159 study participants (97%) were full-time students. In terms of the employment status, 131 subjects (79.9%) were not employed, 10 students (6.1%) were working as full-time employees, and 23 (14%) subjects were part-time employees. Regarding PA facilities the subjects were using, 63 (38.4%) students were utilizing on-campus facilities, 33 (20.1%) subjects were using off-campus facilities, and 68 (41.5%) students were not deploying any PA facilities. The 68 subjects not using PA facilities included both PA participants and non-participants.

### 3.2. Descriptive statistics

Table 1 shows the results of the descriptive statistical analysis on the

**Table 1**

Results of the descriptive statistical analysis on PA frequency, PA Self-Efficacy, PA Stages of Change, and Social Support for PA among the study subjects living in South Korea, November 2016.

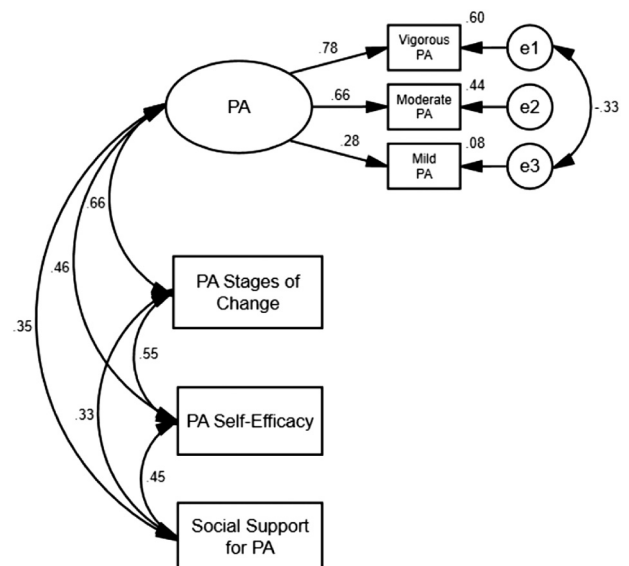
	N	Mean	Standard deviations	Standard errors	Skewness	Kurtosis
Vigorous PA	164	1.07	1.38	0.11	1.35	1.68
Moderate PA	164	1.41	1.67	0.13	1.36	1.66
Mild PA	164	3.79	2.46	0.19	-0.17	-1.34
PA Self-Efficacy	164	1.53	0.83	0.06	0.21	-0.04
PA Stages of Change	164	3.07	1.40	0.11	0.18	-1.33
Social Support for PA	164	21.78	8.41	0.66	0.39	0.12

measured variables. As shown in Table 1, the study participants were most frequently engaged in mild-intensity PA (average = 3.79 days per week; standard deviation = 2.46) among three intensity levels of PA. The mean of PA Self-Efficacy was 1.53 (standard deviation = 0.83), and the average of Social Support for PA was 21.78 (standard deviation = 8.41).

The mean of PA Stages of Change was 3.07 with a standard deviation of 1.40 (Table 1), which means the study participants spread throughout the five stages. The number of the subjects for each stage was 20 (12.2%) for pre-contemplation, 51 (31.1%) for contemplation, 33 (20.1%) for preparation, 17 (10.4%) for action, and 43 (26.2%) for maintenance.

### 3.3. CFA

Fig. 1 demonstrates the CFA model of PA, PA Self-Efficacy, PA Stages of Change, and Social Support for PA. The absolute model fit indices supported the fit of the CFA model:  $\chi^2$  statistic = 12.06 ( $p < .05$ ), CMIN/DF = 2.41, GFI = 0.98, AGFI = 0.90, and RMSEA = 0.09 (LO = 0.02; HI = 0.16). The incremental model fit indices also supported the appropriateness of the model fit: NFI = 0.95, TLI = 0.90, and CFI = 0.97.



**Fig. 1.** Examining convergent, discriminant, and nomological validity of the variables. PA is a latent variable estimated with three indicators of Vigorous, Moderate, and Mild PA. PA Stages of Change, PA Self-Efficacy, and Social Support for PA are measured/observed variables. The two-way arrows represent correlations. All the factor loading values were standardized. Note. Abbreviations: PA = Physical Activity; e = measurement error.

For the convergent validity of the latent variable of PA, the reliability coefficient was 0.61 with the three indicators of vigorous, moderate, and mild PA (Fig. 1). The Average Variance Extracted (AVE) of PA was 0.60. The two types of results verified the convergent validity of the latent variable of PA.

For the discriminant validity of the variables, all of the correlations among the variables were  $r < 0.85$ , which means discriminant validity of all the variables in the CFA model was verified. The highest was  $r = 0.66$  ( $p < .001$ ) (between PA and PA Stages of Change), and the lowest was  $r = 0.33$  ( $p < .001$ ) (between PA Stages of Change and Social Support for PA).

In terms of the nomological validity, the CFA model (Fig. 1) showed positive correlations among all the variables (i.e., PA, PA Self-Efficacy, PA Stages of Change, and Social Support for PA). The result was aligned with the theory of SMRC, which explains the variables are positively correlated with one another (Marcus & Forsyth, 2008). In particular, PA and PA Stages of Change showed the highest correlation, which is the core part of SMRC.

### 3.4. Investigation of the structural model

The current study formulated a structural model for the hypothesis test (Fig. 2). The model fit indices supported the good fit of the structural model. The absolute model fit indices were  $\chi^2$  statistic = 12.057 ( $p < .05$ ), CMIN/DF = 2.411, GFI = 0.98, AGFI = 0.90, and RMSEA = 0.09 (LO = 0.02; HI = 0.16). The incremental model fit indices were NFI = 0.95, TLI = 0.90, and CFI = 0.97. The model fit results of the CFA and structural models were the same.

The direct effects among PA, PA Self-Efficacy, PA Stages of Change, and Social Support for PA are visually demonstrated in Fig. 2. All the direct ( $\beta$ ) and indirect ( $\beta_{\text{indirect}}$ ) effects available in the structural model are presented in Table 2. The explanatory power on the PA variable was  $r^2 = 0.46$ , which means 46% of the variance of PA was explained with PA Self-Efficacy (non-significant), PA Stages of Change (significant), and Social Support for PA (non-significant). Technically, only PA Stages of Change was a statistically significant factor which directly predicted PA.

As shown in Table 2, PA Stages of Change ( $\beta = 0.57, p < .01$ ) had a direct effect on PA while PA Self-Efficacy and Social Support for PA did not have a direct effect on PA. PA Self-Efficacy had a direct effect ( $\beta = 0.50, p < .001$ ) on PA Stages of Change ( $r^2 = 0.31$ ), whereas Social Support for PA did not have a direct effect on PA Stages of

**Table 2**  
Direct effects and indirect effects of the variables.

Dependent variable	Independent variable	Direct effects (Regression weights = $\beta$ )	S.E.	C.R.	$p$ for $\beta$	Indirect effects ( $\beta_{\text{indirect}}$ )
PA	PA Self-Efficacy	0.09	0.08	0.95	> .05	0.29
	PA Stages of Change	0.57	0.10	2.73	< .01	N/A
	Social Support for PA	0.12	0.01	1.32	> .05	0
PA Stages of Change	PA Self-Efficacy	0.50	0.12	6.87	< .001	N/A
	Social Support for PA	0.11	0.01	1.47	> .05	N/A

Note. PA = Physical Activity.

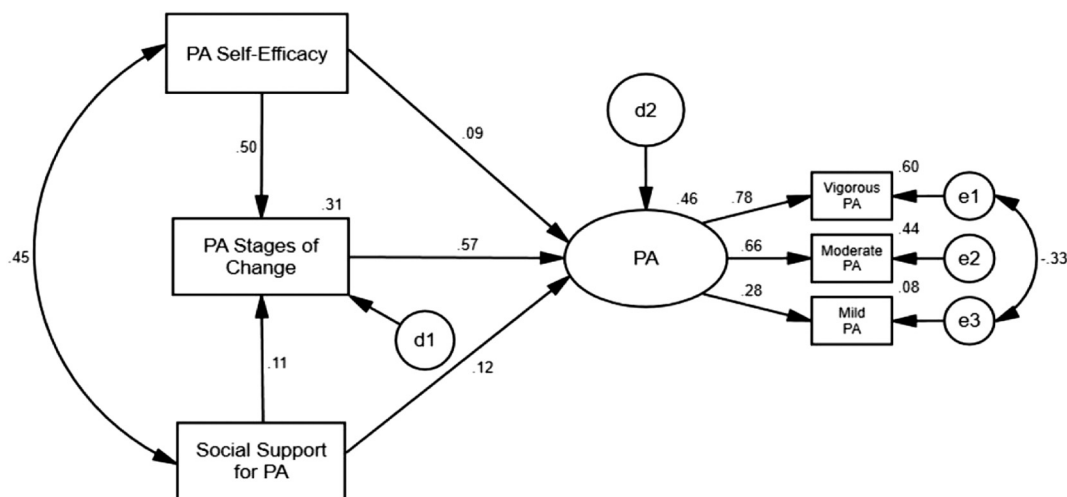
Change. Moreover, PA Self-Efficacy had an indirect effect ( $\beta_{\text{indirect}} = 0.29$ ) on PA through PA Stages of Change while Social Support for PA did not have an indirect effect on PA. There was no total effect because none of the variables had both direct and indirect effects. Additionally, PA Self-Efficacy and Social Support for PA had a correlation of  $r = 0.45$  ( $p < .001$ ). Mild PA had a correlation of  $r = -0.33$  with Vigorous PA ( $p < .01$ ). These correlations are demonstrated as two-way arrows in Fig. 2.

### 4. Discussion & conclusions

The study purpose was to investigate the roles of social support, self-efficacy, and the stages of behavioral change in PA in the Korean culture. For the study goal, the current study examined the five research hypotheses (Table 3). Two respects made this research different from previous SMRC studies. Firstly, the present study employed a social science context of culture beyond the public health angle in interpreting the data analysis results. Secondly, the current study discovered new direct and indirect effects by deploying SEM.

Table 3 shows whether the data analysis results supported each research hypothesis. The results supported RH 1 & 3 and rejected RH 2, 4, & 5. In other words, PA Stages of Change (i.e., the stages of behavioral change) and PA Self-Efficacy played pivotal roles in Korean college students' PA behavior, whereas Social Support for PA did not show a significant direct or indirect effect on PA behavior.

For RH 1, the current study found that 46% of PA behavior was



**Fig. 2.** Investigating direct effects and indirect effects among the variables. PA is a latent variable estimated with three indicators of Vigorous, Moderate, and Mild PA. PA Stages of Change, PA Self-Efficacy, and Social Support for PA are measured/observed variables. The one-way arrows indicate regression relationships while the two-way arrows represent correlations. All the factor loading values were standardized.  
Note. Abbreviations: PA = Physical Activity; e = measurement error; d = disturbance.

**Table 3**  
Results of the research hypotheses test.

Research hypothesis	If supported
RH1: PA Stages of Change has a direct effect on PA ( $\beta = 0.57$ ).	Y
RH2: PA Self-Efficacy has a direct effect on PA.	N
RH3: PA Self-Efficacy has an indirect effect on PA through PA Stages of Change ( $\beta_{\text{indirect}} = 0.29$ ).	Y
RH4: Social Support for PA has a direct effect on PA.	N
RH5: Social Support for PA has an indirect effect on PA through PA Stages of Change.	N

Note. Abbreviations: RH = Research Hypothesis; Y = Yes; N = No.

explained with PA Stages of Change, supporting SMRC (Marcus & Forsyth, 2008). PA Stages of Change was a significant predictor of PA behavior. Therefore, the present study suggests that health practitioners can utilize PA Stages of Change to track individuals' behavioral change in PA.

Regarding RH 2 and 3, the current study found PA Self-Efficacy had an indirect effect on PA, supporting SMRC (Marcus et al., 1992a; Marcus & Forsyth, 2008; Marcus & Lewis, 2003; Marcus & Owen, 1992; Marcus et al., 1992d). A new finding was that the study identified the path of PA Self-Efficacy to PA as indirect. In this indirect path, PA Stages of Change was a mediator, which was another new finding. The research finding implies that high PA Self-Efficacy does not necessarily reflect high PA level, rather high PA Self-Efficacy indicates an individual's tendency/choice to put more efforts to be physically active. This implication was supported by Bandura (1995) who claimed a significant influence of domain-specific self-efficacy on people's choices in the domain. As examples, Bandura (1995) explained that high math self-efficacy encouraged college students to choose mathematics related majors (Betz & Hackett, 1983; Hackett, 1985; Hackett & Betz, 1989) and that occupational self-efficacy influenced the development of core career choice predictors of interests, objectives, and values (Bandura, 1986; Betz & Hackett, 1986). Therefore, the current study recommends that health practitioners need to emphasize individuals' positive choices resulting in advancement on the stages of behavioral change in PA rather than aim for an immediate increase of PA level when to increase participants' self-efficacy in PA/exercise programs.

For RH 4 and 5, Social Support for PA did not have a direct or indirect effect on PA, not supporting SMRC (Marcus & Forsyth, 2008). The possible reason for the non-effect was the nature of the collectivistic culture in South Korea. Taylor et al. (2004) discovered that Korean college students used social support less than American college students in dealing with stress; taking time to engage in PA could be a stressor for college students maintaining a busy school schedule. Taylor et al. (2004) explained that Korean students preferred not to risk the social network and tended to solve problems on their own because the pursuit of relationships was more important than problem-solving in the Korean culture (e.g., Korean college students worried whether they made people feel uncomfortable by asking for help).

However, the current study still suggests health practitioners should not overlook Social Support for PA because it had a high correlation of  $r = 0.45$  with PA Self-Efficacy. This correlation implies a possibility that Social Support for PA might positively influence the subjects' PA behavior by interacting with PA Self-Efficacy which had a considerable indirect effect on PA. The possibility can be explained with the cultural tendency that social support in the collectivistic culture of South Korea functioned as a mean to protect group members' self-efficacy rather than to provide benefits directly related to the members' personal welfare and interests (i.e., PA). Individuals in the collectivistic culture (i.e., Korean culture) receive the protection from the in-group in return for the loyalty that the people value social relationships more than personal goals (i.e., maintain or increase PA) and prefer not to make others uncomfortable by seeking help for personal interests (Bandura, 1995; Taylor et al., 2004).

## 5. Limitations & recommendations

The application of the study findings to youth and older adults can be limited as the present study selected university students as the subjects. Moreover, applying the research findings to another culture which is not collectivistic can be delimited. Future SMRC studies should address more various populations which have different social characteristics in ethnicity, economic status, educational level, gender, culture, geographical region, and religion. Researchers also need to employ diverse social science angles in interpreting SMRC studies over the public health perspective to discover better ways to apply the study findings to socially various communities and individuals.

## Conflict of interest

The authors declare there is no conflict of interests.

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## References

- Anderson, J.C., Gerbing, D.W., 1988. Structural equation modeling in practice: a review and recommended two-step approach. *Psychol. Bull.* 103 (3), 411.
- Ball, J., 1996. Preventive medicine: the recreation edge. *Recreat. Can.* 54 (1), 11–13.
- Bandura, A., 1986. *Social Foundations of Thought and Action*. PrenticeHall, Englewood Cliffs, NJ.
- Bandura, A., 1995. Self-Efficacy in Changing Societies. In: Cambridge University Press.
- Betz, N.E., Hackett, G., 1983. The relationship of mathematics self-efficacy expectations to the selection of science-based college majors. *J. Vocat. Behav.* 23 (3), 329–345.
- Betz, N.E., Hackett, G., 1986. Applications of self-efficacy theory to understanding career choice behavior. *J. Soc. Clin. Psychol.* 4 (3), 279–289.
- Bouchard, C., Shephard, R.J., Stephens, T. (Eds.), 1994. *Physical Activity, Fitness, and Health: International Proceedings and Consensus Statement*. Human Kinetics, Champaign, IL.
- Centers for Disease Control and Prevention (CDC), 2014. Facts about physical activity. In: Data and Statistics, Retrieved from <https://www.cdc.gov/physicalactivity/data/facts.htm>.
- Ding, L., Velicer, W.F., Harlow, L.L., 1995. Effects of estimation methods, number of indicators per factor, and improper solutions on structural equation modeling fit indices. *Struct. Equ. Model. Multidiscip. J.* 2 (2), 119–143. <http://dx.doi.org/10.1080/10705519509540000>.
- Hackett, G., 1985. Role of mathematics self-efficacy in the choice of math-related majors of college women and men: a path analysis. *J. Couns. Psychol.* 32 (1), 47.
- Hackett, G., Betz, N.E., 1989. An exploration of the mathematics self-efficacy/mathematics performance correspondence. *J. Res. Math. Educ.* 261–273.
- Kaplan, D., 2008. *Structural Equation Modeling: Foundations and Extensions*. SAGE, New York, NY.
- Kim, Y.H., 2004. Korean adolescents' exercise behavior and its relationship with psychological variables based on stages of change model. *J. Adolesc. Health* 34 (6), 523–530.
- Kim, Y., 2008. A stage-matched intervention for exercise behavior change based on the transtheoretical model. *Psychol. Rep.* 102 (3), 939–950.
- Kim, Y., Cardinal, B.J., 2009. Effects of a transtheoretical model-based stage-matched intervention to promote physical activity among Korean adults. *Int. J. Clin. Health Psychol.* 9 (2).
- Lee, H.S., Lim, J.H., 2013. *Structural Equation Modeling with AMOS 20.0*. JypHyunJae Publishing Co., Seoul.
- Marcus, B.H., Forsyth, L.H., 2008. *Motivating People to Be Physically Active*, 2nd ed. Human Kinetics, Champaign, IL.
- Marcus, B.H., Lewis, B.A., 2003. Physical activity and the stages of motivational readiness for change model. In: President's Council on Physical Fitness and Sports Research Digest, Retrieved from: <http://files.eric.ed.gov/fulltext/ED474896.pdf>.
- Marcus, B.H., Owen, N., 1992. Motivational readiness, self-efficacy and decision-making for exercise. *J. Appl. Soc. Psychol.* 22 (1), 3–16. <http://dx.doi.org/10.1111/j.1559-1816.1992.tb01518.x>.
- Marcus, B.H., Banspach, S.W., Lefebvre, R.C., Rossi, J.S., Carleton, R.A., Abrams, D.B., 1992a. Using the stages of change model to increase the adoption of physical activity among community participants. *Am. J. Health Promot.* 6 (6), 424–429.
- Marcus, B.H., Rakowski, W., Rossi, J.S., 1992b. Assessing motivational readiness and

- decision making for exercise. *Health Psychol.* 11 (4), 257. <http://dx.doi.org/10.1037/0278-6133.11.4.257>.
- Marcus, B.H., Rossi, J.S., Selby, V.C., Niaura, R.S., Abrams, D.B., 1992c. The stages and processes of exercise adoption and maintenance in a worksite sample. *Health Psychol.* 11, 386–395. <http://dx.doi.org/10.1037/0278-6133.11.6.386>.
- Marcus, B.H., Selby, V.C., Niaura, R.S., Rossi, J.S., 1992d. Self-efficacy and the stages of exercise behavior change. *Res. Q. Exerc. Sport* 63 (1), 60–66. <http://dx.doi.org/10.1080/02701367.1992.10607557>.
- Ministry of Culture, Sports, and Tourism, 2017. 2016 Kookmin saenghwal cheyook chamyeo shiltae josa (Investigation of people's physical activity participation). Ministry of Culture, Sports, and Tourism, Sejong City. Retrieved from [https://www.sports.re.kr/front/board/bs/boardView.do?board\\_seq=74&pageNo=1&menu\\_seq=865&con\\_seq=2848&keyKind3=&keyKind4=&keyKind5=&keyKind6=&keyKind7=&keyKind=TITLE&keyWord=](https://www.sports.re.kr/front/board/bs/boardView.do?board_seq=74&pageNo=1&menu_seq=865&con_seq=2848&keyKind3=&keyKind4=&keyKind5=&keyKind6=&keyKind7=&keyKind=TITLE&keyWord=).
- Moon, S., 2013. *Basic Concepts and Applications of Structural Equation Modeling*. Hakjisa, Seoul.
- Park, I.S., Park, J., Ryu, S.Y., Kang, M.G., 2011. Factors associated with stages of exercise behavior change applying the transtheoretical model in upper grade elementary students. *Kor. J. Health Educ. Promot.* 28 (3), 67–82.
- Sallis, J.F., Grossman, R.M., Pinski, R.B., Patterson, T.L., Nader, P.R., 1987. The development of scales to measure social support for diet and exercise behaviors. *Prev. Med.* 16, 825–836. [https://doi.org/10.1016/0091-7435\(87\)90022-3](https://doi.org/10.1016/0091-7435(87)90022-3).
- Tabachnick, B.G., Fidell, L.S., Osterlind, S.J., 2001. *Using Multivariate Statistics*, 5th ed. Pearson, New York, NY.
- Taylor, S.E., Sherman, D.K., Kim, H.S., Jarcho, J., Takagi, K., Dunagan, M.S., 2004. Culture and social support: who seeks it and why? *J. Pers. Soc. Psychol.* 87 (3), 354.
- Tessaro, I., Campbell, M., Benedict, S., et al., 1998. Developing a worksite health promotion intervention: health works for women. *Am. J. Health Behav.* 22 (6), 434–442.
- Tinsley, H.E., Tinsley, D.J., 1987. Uses of factor analysis in counseling psychology research. *J. Couns. Psychol.* 34 (4), 414. <http://dx.doi.org/10.1037/0022-0167.34.4.414>.
- U.S. Department of Health and Human Services, 1996. *Physical Activity and Health: A Report of the Surgeon General*. Diane Publishing, Darby, PA.
- Wankel, L.M., Berger, B., 1991. The personal and social benefits of sport and physical activity. In: Driver, B.L., Brown, P.J., Peterson, G.L. (Eds.), *Benefits of Leisure*. Venture, State College, PA, pp. 121–144.
- Young, S.J., Lee, D., Sturts, J.R., 2015. Motivational readiness of community college students engaging in physical activity. *Recreat. Sports J.* 39 (2), 92–104. <http://dx.doi.org/10.1123/rsj.2015-0038>.